HIGH SCHOOL AND UNIVERSITY
MATRICULATION EXAMINATIONS BOARD.

**DEPARTMENTAL EXAMINATIONS, 1936**

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# PHYSICS 1.

Time—2½ hours.

## SECTION A.

Answer *question 1* and any other *two questions* in this section.

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12 **1.** *Either* Outline a simple experiment to illustrate each of the following: diffusion, osmosis, sublimation, capillary action.

*Or* Discuss the molecular theory of matter and show how it explains the characteristic properties of solids, liquids, and gases.

4 **2.** (*a*) Illustrate the production of heat by
(1) mechanical action,
(2) chemical action.

3 (*b*) Two uniform metal strips, one of iron and one of copper, are riveted together to form a compound bar. Explain clearly what occurs when the bar is heated.

7 (*c*) Explain the construction and operation of *either* the maximum *or* the minimum thermometer.

14 **3.** An iron radiator having a mass of 55 kilograms is shut off when it contains 120 grams of steam at a temperature of 100° C. How much heat is imparted to the room by the condensation of the steam and the cooling of the water and the radiator to a temperature of 40° C.?

Specific heat of iron is 0.113.

Heat of vaporization of water is 536.

9 **4.** (*a*) Write complete explanatory notes on any *three* of the following:

(1) The influence of pressure on the melting point of solids.
(2) The action and use of freezing mixtures.
(3) The factors affecting the rate of evaporation of liquids.

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(4) The effect of pressure on the boiling point of liquids.

(5) The separation of a mixture of liquids by fractional distillation.

5 (*b*) Heat is steadily applied to a mass of ice with an initial temperature of —5° C. until it has been completely changed into steam at 100° C. Discuss the changes caused by the absorption of heat throughout the procedure, with special reference to what occurs at 0° C. and 100° C.

8 **5.** (*a*) Outline the complete procedure for the determination of the relative humidity of the air in a room.

6 (*b*) The bulbs of two identical thermometers are coated, one with lamp-black, the other with silver. Compare their readings when both are

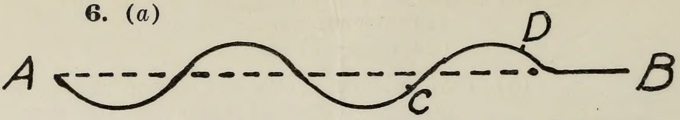
(1) immersed in a water bath.
(2) exposed to the direct rays of the sun.
(3) exposed to the sky on a clear night.

Explain why they do not agree on all these occasions.

## SECTION B.

Answer *question 6* and any other *two questions* in this section.

**6.** (*a*)



AB represents a rubber tube fastened to a support at B. The end A is moved rapidly up and down causing wave motion.

1 (1) What type of wave motion is illustrated?

(2) Reproduce the diagram and upon your diagram

1 (i) indicate the direction in which the wave motion is being transmitted.

1 (ii) indicate and label one wave length.

2 (iii) indicate by arrows the direction of motion of each of the points C and D of the tube.

1 (iv) indicate and label the amplitude of vibration.

6 (*b*) If the velocity of sound in air is 1088 feet per second, what will be the length of the shortest tube, open at both ends, that will be in resonance with a tuning fork having a frequency of 256? Compare the length of this tube with that of a closed tube under similar conditions.

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7 **7.** (*a*) The intensity of illumination varies inversely as the square of the distance from the source of light. Describe in detail an experiment to verify the above law.

7 (*b*) An object is placed in front of a concave mirror at a point beyond the centre of curvature. Draw a diagram to show the position and relative size of the image.

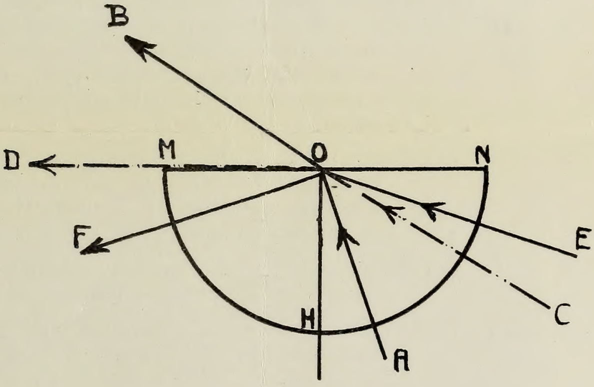
3 **8.** (*a*) Describe an experimental method for finding the focal length of a convex lens.

7 (*b*) With the aid of a diagram, explain how a convex lens can be used as a simple microscope or magnifying glass.

4 (*c*) When illuminated by green light, explain the apparent color of

(1) a piece of white paper,
(2) a red ribbon.

4 **9.** (*a*)



The above diagram represents a semicircular block of glass with rays of light passing through it along the paths AOB, COD, and EOF. O is the centre point of MN and HO is perpendicular to MN.

Name, by using letters:

(1) an incident ray which becomes totally reflected.

(2) a refracted ray.

(3) the critical angle for glass and air.

(4) the normal to the surface separating the glass and air.

2 (*b*) In the diagram of (*a*) above, why is there no bending as the rays enter the glass?

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8 (*c*) Copy the following sentences, filling in the blanks with appropriate words.

(1) A .................... medium is necessary for the transmission of sound.

(2) When sound is reflected we hear the ....................

(3) The pitch of a sound depends upon the ....................

(4) The darkest portion of a shadow is the ....................

(5) The image produced by a diverging lens is always erect, ...................., and smaller than the object.

(6) The dispersion of white light by means of a prism produces the ....................

(7) Blue and .................... are complementary colors.

(8) ....................lenses are used in spectacles designed to correct long-sightedness.

## SECTION C.

Answer any *two questions* in this section.

4 **10.** (*a*) The end A of a soft iron bar AB is held a short distance from the N-pole of a permanent bar magnet. What type of pole is induced at A? Describe an experiment to support your answer.

4 (*b*) Describe carefully a method by which an unmagnetized steel bar could be made into a permanent magnet. Indicate the N-pole of the new magnet.

2 (*c*) Why is a permanent bar magnet injured when it is dropped or hammered?

5 **11.** (*a*) Name the materials required and show by diagram how the simple Voltaic cell is constructed. Indicate clearly the direction of the current in the wire conductor when the circuit is closed.

2 (*b*) Write a note on the source of the energy in the Voltaic cell.

3 (*c*) Ohm's law is represented by the formula $C = \frac{E}{R}$. Name the unit used in measuring each of the quantities involved in this law.

5 **12.** (*a*) Describe an experiment to show that a wire through which an electric current is flowing is surrounded by a magnetic field. By means of a diagram, indicate the direction of the current and of the lines of force.

5 (*b*) Describe, using a diagram, the construction and operation of the common electric door bell.

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